are certain light gases which, although nearly absent from the surface of the ground, prevail in the upper strata. What is the composition of the air at different elevations?

(5) We know that an intense ionization is produced by the solar rays and is extinguished in the upper atmospheric strata. What are the consequences of this phenomenon? Is the key to the storms to be found in it?

(6) At the same time the solar radiation appears to us as manifestly the direct cause of all the phenomena. Its study imposes itself upon us as the surest means of determining the true nature of our sun. Is it a variable star? Is it continually decreasing? These questions are of the first importance for the very existence of our planet.

From a nearer point of view, is it not evident that if we knew certainly the laws of this complex radiation, and the manner in which it acts upon our atmosphere, we could deduce from this the weather conditions at a certain fixed time? And this assuredly is the real problem of meteorology.[1]

There is plenty of work for everyone, my dear colleagues. Each of us should do his best on the problems which interest him most and should make every effort to maintain for the Meteorological Society of France the high reputation which it has acquired during the first fifty years of its existence.

METEOROLOGY AT WILLIAMS COLLEGE, MASSACHUSETTS.

Mr. Willis I. Milham, Director of the Field Memorial Observatory, Williams College, Williamstown, Mass., states that observations have been taken at that place since 1816. The records for the first twenty-two years and the last twenty years are in good condition, but those for the other years are either missing or very imperfect. Systematic instruction in meteorology is also given in the college. Last year lectures on this subject were given for three weeks in connection with the course on descriptive astronomy. This year there will be a half-year course, three times a week, on meteorology and eight or ten men will elect this course, which it is hoped will become a permanent feature.

IS THERE A SEVEN-YEAR CYCLE IN RAINFALL IN ILLINOIS?

In the Tenth Report of the State Entomologist of the State of Illinois, or the Fifth Annual Report of Dr. Cyrus Thomas, dated December 30, 1880, and printed in the Transactions of the Department of Agriculture of the State of Illinois for the year 1880, Dr. Thomas has an extensive article (pp. 47-59), on the relation of meteorological conditions to insect development. By combining the records from stations in Illinois and neighboring portions of Iowa and Missouri, beginning with the record at Athens in 1840 and including Augusta, Chicago, Dubuque, St. Louis, and other stations not mentioned, but rejecting Cairo and the early records at Sandwich, Dr. Thomas compiled a table and diagrams giving the monthly and annual total rainfall and average temperature, both of which showed systematic cycles of seven years each.

We do not know the method adopted in compiling these tables of averages. The published Table, 3, Average Monthly Rainfall of Illinois for 1854-1877, would be very valuable for climatological study if we could feel sure that each figure represents the average for the whole State, computed by a uniform method throughout the table. But from the fact that Dr. Thomas mentions that for the year 1872 he had only the record for one doubtful station, we infer that all of his averages are formed by combining whatever stations were available without taking account of certain principles recognized by modern climatology. As these principles are liable to be neglected by other students, we recapitulate them as follows:

1.—When several stations have records for different groups of years and are to be combined together into one general average of many years, we must eliminate the differences between the records, depending on the differences in the exposure of the gages and in the kinds of gages, as also those depending upon the distances of the stations from each other and also those depending on the monthly and annual irregularities in rainfall.

2.—The effects of exposure and location at the same locality can ordinarily be best determined by comparing records taken at the same time at the two stations or gages.

3.—If several stations are combined in order to form a mean for any one month or year, then those same stations must appear in every other monthly or annual mean that is to be compared with the former, in order to eliminate chronological variations. In order to secure monthly or annual means for this latter purpose, when no observed record is at hand, one must interpolate geographically between neighboring stations. In this way every monthly mean becomes comparable with the others because it depends upon the same stations. Thus, also, the general averages for different parts of a State will depend upon the same fundamental period of years.

4.—In general, it is most convenient to reduce each observed monthly and annual value to ratios or statements of percentages, adopting the average annual rainfall as the divisor.

It is only when we have many stations thus corrected for chronological and geographic irregularities that we are properly prepared to begin the search for cycles or other systematic changes. The values for successive years, as published in Dr. Thomas's table, are not sufficiently homogeneous to allow of basing on them any study into secular periodicity of precipitation.

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. C. F. von Herrmann, Section Director, Raleigh, N. C., has been detailed by order of the Chief of Bureau to respond to the request for instruction in meteorology at the Agricultural and Mechanical College at West Raleigh. According to the preliminary schedule forwarded by Mr. von Herrmann, the senior class will receive a full course of instruction, using Waldo's Elementary Meteorology as the basis. The recitations will occupy one hour each week during the college term of thirty-six weeks. An additional course of lectures will also be delivered covering the following topics:

1. The atmosphere: Composition, density, arrangement, physical properties, etc.
2. The temperature of the atmosphere.
3. The temperature of the atmosphere with reference to the climates of the earth.
4. The pressure of the air.
5. The moisture of the air, its condensation into frost, dew, fog, clouds, etc.
6. Precipitation.
7. Winds and the general circulation.

[1] If the complex radiation from the sun has any variations in its complexity or its intensity, these will probably exert corresponding influences on the earth's atmosphere and the weather experienced at any station. Now we observe that our weather is extremely variable, from hour to hour and day to day, without any accompanying appreciable variation in the solar radiation. It is, therefore, evident that our weather conditions at any moment are subject to a large range of variability due to changes in our own atmospheric conditions occurring under the influence of a constant solar radiation. We have not yet been able to explain the character and extent of these variations, but there is every evidence that they are the mechanical and physical phenomena proper to the earth's atmosphere itself. We are not yet in a position that warrants us to believe that if we knew the variations in the solar radiation we could deduce or predict weather conditions any better than when the radiation is uniform and constant.—*C. A.*